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Effect of Fordyce Happiness Model on depression, stress, anxiety, and fatigue in patients with multiple sclerosis

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ABSTRACT

Purpose: This study was conducted to investigate the effect of Fordyce Happiness Model (FHM) on depression, stress, anxiety, and fatigue in MS patients.
Methods: In this clinical trial, 140 MS patients assigned to experimental and control groups. Depression, anxiety, stress, and fatigue were measured by Depression Anxiety Stress Scale-21 and Piper Standard Scale before and immediately and three months after the implementation of FHM. The data were analyzed by SPSS 18.
Results: Independent *t*-test indicated that total scores of stress, depression, and fatigue of the two groups were not significantly different before the intervention but were significantly different after the intervention ($P<0.05$). Moreover, anxiety scores of the two were not significantly different after the intervention ($P>0.05$).
Conclusion: FHM can assist MS patients to manage their disease and associated problems in life. Besides that, since FHM is efficient and costless, it can be incorporated into the health interventions for MS patients.

1. Introduction

Multiple sclerosis (MS) is a prevalent, chronic, progressive, and central nervous system (CNS)-demyelinating disease in young adults. MS is more prevalent in young people and is associated with declined individual and social functions [1]. In the USA, approximately 500000 people are suffering MS, and 8000 new cases are diagnosed each year. MS usually develops in people aged 20–40 years. It is the third leading cause of disability in the USA [2]. In Iran, approximately 50000 people are suffering MS, and MS prevalence is higher in Isfahan (70/100000 people) [3].

Increasing the number of MS patients necessitates paying further attention to their treatment-related issues. In addition to including physical disorders, clinical symptoms and complications may include a wide range of mental and psychiatric disorders, of which stress, anxiety, and depression are considered to be most irritating. Psychological domains of chronic disorders are consistently paid less than adequate attention, such that most scientific resources have mainly addressed the neurological symptoms rather than psychosocial domains of MS [4].

Besides that, stress and anxiety contribute greatly to stimulating onset of MS attacks and exacerbating associated symptoms. Atarod and Amanat, 2009 investigated worry level and its Society with anxiety and depression in MS patients, and reported that the MS patients were worried about two domains: the effects on physical activity and the effects, due to the disease *severity*, on social interactions, family relationships, and daily activities [5].

In addition, depression is one of the most prevalent psychiatric disorders which is seen in 50%–60% of MS patients [6]. The causes of depression in MS patients include the treatment course and unpredictability of MS, recurrent attacks, loss of former capabilities,

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and certain problems such as job loss and drugs-induced complications. Depression severity may adversely affect quality of life, physical capabilities, and MS recurrence. In addition, suicide attempt is closely related to development of depression and severity of associated symptoms, such that the risk of suicide is usually 7.7 times higher in MS patients than normal population [7].

Suicidal thinking is 30% prevalent among MS patients in Iran with suicide attempts being five times higher than normal population [1]. Therefore, depression management has consistently been one of the main concerns of health care teams.

Fatigue, another prevalent problem in MS patients, refers to a subjective feeling of lack of physical and mental energy to do and complete routine and desired activities, which is diagnosed by caregiver or the patient [4].

Eighty percent of MS patients suffer fatigue and associated effects on their daily activities, 71% of the patients have been reported to be absent from work for a number of days, and 28% to be forced to resign and 75% to change their job or to choose to leave a higher paying job for a lower one due to severe fatigue [6].

Regarding the nature of MS and since MS has no definite prognosis and can cause long-term problems, non-pharmacological therapies are strongly recommended. Among non-psychological therapies, complementary therapies are particularly important to control and improve disease-associated problems and to promote quality of life. Besides that, despite inadequate and limited scientific evidence on the safety and efficacy of complementary therapies, an increasing number of MS patients are using complementary therapies. Hence, investigating and monitoring the efficacy of complementary therapies can be useful. Complementary therapies are community-oriented and are used to enhance physical and psychological comfort of patients [8].

Happiness is one of the non-pharmacological therapies that helps to cope with stress. Happiness is an internal feeling with natural origin that has external outcomes. Happiness refers to people's perception of degree or level of desirability of overall quality of life. Happiness addresses the question "*how much does a person like his/her life?*" [9].

Forsberg offered three meanings for health: lack of disease, personal characteristics, and a state of peace, rehabilitation, and happiness [10]. Some experts have argued that happiness is the first condition for health development. The people who are happy feel more secure, take decision more easily, have a more cooperative spirit, and feel more satisfied compared to the people with whom they are living [11,12].

Happy people enjoy a stronger sense of personal control, are more likely to think about their capabilities rather than their inabilities, and cope with stress more often [13]. Happiness strengthens immune and cardiovascular systems and improves health. Lack of happiness is stressful and stress can lead to dangerous diseases [14].

Lama,2010 have argued that learning happiness is the first thing to do to achieve happiness and hence people can be trained to learn how to be happy [15]. Fordyce Happiness Model (FHM) is an approach to train happiness. FHS consists of 14 principles: eight cognitive principles and six behavioral principles. These principles include development of healthy personality, removal of concerns, reduction of expectations and wishes, being the real self, and giving priority to happiness [16].

Regarding stupendous costs of pharmacotherapies, which is currently a challenge facing health care systems, adverse side effects of some drugs, and the adverse effects of depression, anxiety, stress, and fatigue on quality of life among MS patients, this study was conducted to investigate the effect of the FHM on depression, anxiety, stress, and fatigue in MS patients.

2. Materials and methods

This clinical trial was conducted in 2015–2016 and registered as *IRCT2014112420064N1* in the Iranian Register of Clinical Trials. The study population consists the patients referring to the *Multiple Sclerosis Society of Isfahan*. The number of participants was estimated to be 63 in each group according to the formula below:

$n = 2(z_1 + z_2)^2 \times s^2/d^2$ Having predicted 10 dropouts for each group, we finally decided to enroll 70 people in each one.

The inclusion criteria were being definitely diagnosed with MS and having records in the Society and the exclusion criteria having history of other psychiatric disorders including major depressive disorder (according to the medical records and the physician's examinations) or bipolar disorder (except for cognitive disorders by which MS is characterized), substance dependency, any neurological disorders, history of taking corticosteroids or the disease recurrence within the previous six months.

Because the patients were not hospitalized and regularly referred to the *Association*, to follow randomized assignment, we decided to run the sampling within two consecutive months until we enrolled an adequate number of participants. Accordingly, 70 numbers, equal to the number of people required in each group, were developed and the numbers 1–70 were randomly assigned to two groups: experimental and control. After eligible patients referred to the *Association*, a number was randomly assigned to each patient according to his/her referring time and the patients were assigned to the two groups.

The intervention was implemented within two days a week. For the control group, a routine protocol was conducted. For blinding, the patients of the control group referred to the *Society* on certain days of week and those of the experimental on other days.

To gather the data, a questionnaire of demographic characteristics, *Depression Anxiety Stress Scale 21* (*DASS-21*) and *Piper Standard Scale* were used. To investigate depression, anxiety, and stress, *DASS-21*, developed by Lovibond and Lovibond in 1995, was used and its validity and reliability were confirmed [17]. To measure fatigue, the *Piper Standard Scale* was used. This scale consists of 27 items that measures fatigue in terms of four domains: behavioral, affective, tactile, and cognitive. Validity (content and concurrent) of this scale has already been confirmed [18].

To assess the reliability of the instruments used in this study, split-half reliability was used. Pearson's correlation coefficient was estimated to be 0.79 and 0.89 for the half of the *DASS-21* and the *Piper Standard Scale*, respectively.

After the participants were randomly assigned to the experimental and control groups and pretest was administered, the FHM was conducted for the experimental group in the room determined to hold the training sessions. This training program was conducted within eight 1- to 1.5-h sessions, two sessions a week through lecturing, group discussions, and question and answering, such that the scientific materials were offered within the first half-time of each session and, after a rest, the group discussions and questioning and answering were run about the drills of the subject of interest in the second half-time. At the end of each session, the participants were asked to run through certain drills empirically outside research environment.

The intervention consisted of: defining depression, stress, anxiety, and their symptoms, defining happiness, and explaining its necessity, reviewing the results of previous studies on happiness (the first session); the technique of increasing physical activity, the technique of being productive, and doing useful and meaningful things (the second session); the principles of planning and better organization–the technique of removing concerns, the technique of reducing expectations and wishes (the third session); the technique of enhancing creativity, the technique of living at present (the

fourth session; the technique of increasing social relationships, the technique of being the real self (the fifth session).

The technique of increasing intimacy as the most important source of happiness–the technique of giving priority to happiness and making it invaluable (the sixth session); the technique of expressing emotions, the technique of enhancing optimism (the seventh session); reviewing all the techniques taught, administering post-test (the eighth session).

At completion of the training program, all happy techniques were briefly reviewed with the participants, the participants were asked some questions about their current happiness and optimism levels, and their questions, if any, were answered. Then, *DASS-21* and *Piper Scale* were administered to the participants.

The participants were acknowledged for their participation in the study and the follow-up session was decided to be held three months later. Moreover, to investigate the efficacy of the FHM, the *DASS-21* and *Piper Standard Scale* were administered to the experimental group in the follow-up session.

The study protocol was approved by the Tehran University of Medical Sciences (the Research Project No. 93-02-85-18658 and the Ethics Code 125899). The researcher started the study after the *Multiple Sclerosis Society* provided the formal letter of permission to conduct the study. The patients were ensured that the data are analyzed as confidential and anonymous and the findings are reported in general rather than as case-specific.

The data obtained before and after conduction of the program were analyzed by chi-square test, Mann-Whitney, covariance statistics, repeated measures ANOVA, and independent *t*-test in SPSS 18.

3. Results

Chi-square test and *t*-test indicated that there was no significant difference in distribution of age, marital status, education, economic status, gender, recurrence frequency, and hospitalization duration between the two groups, and the two groups were matched for these variables ($P \geq 0.05$) (Table 1).

The mean age of the participants was 49.32 ± 6.86 years (48.75 years in the experimental group and 49.81 years in the control group). Out of the participants, 75.6% were married and 57.62% were women.

According to independent *t*-test, there was no significant difference in the stress score between the two groups before the intervention, but (immediately and three months) after the intervention, there was a significant difference in the stress score between the two groups ($P < 0.05$). In addition, paired *t*-test indicated a significant difference in the stress score of the experimental group between before and (immediately and three months) after the intervention ($P < 0.05$), but no corresponding significant difference was seen in the control group (Table 2).

According to independent *t*-test, there was no significant difference in the anxiety score between the two groups before the intervention. After (Immediately and three months after) the intervention, the anxiety score decreased yet *in*significantly ($P > 0.05$). According to paired *t*-test, there was a significant difference in the anxiety score of the experimental group between before and (immediately and three months) after the intervention ($P > 0.05$). In the control group, no corresponding significant difference was seen (Table 2).

Regarding depression, independent *t*-test indicated that the depression score was not significantly different between the two groups before the intervention. But, (immediately and three months) after the intervention, there was a significant difference in the depression score between the two groups ($P < 0.05$). As well, paired *t*-test indicated a significant difference in the depression score of the experimental group between before and (immediately and three months) after the intervention ($P < 0.05$), but in the control group, no corresponding significant difference was observed (Table 2).

Independent *t*-test showed that the total score of fatigue was not significantly different between the two groups before the intervention, but (immediately and three months) after the intervention, a significant difference was seen in the total score of fatigue between the two groups ($P < 0.001$). Paired *t*-test also indicated a significant difference in the total score of fatigue between before and (immediately and three months) after the intervention in the experimental group ($P < 0.001$), but in the control group, no corresponding significant difference was seen (Table 3).

4. Discussion

This study demonstrated a significant difference in levels of stress, depression, and total fatigue between before and after the intervention, representing the optimal effect of FHM in decreasing the severity of stress, depression, and total fatigue. Regarding anxiety, however, the difference in the mean score was not significant between before and after the intervention.

To know that a disease may lead to loss of capabilities leads frequently to development of stress. It is therefore important to manage anxiety in MS patients. After three months, the FHM failed to relieve anxiety significantly in the MS patients. Accordingly, anxiety is considered to be an important issue in MS patients and combined pharmacological and non-pharmacological interventions are required. Mackereth et al. study, conducted in England, indicated that progressive muscle relaxation (PMR) was effective in relieving stress in MS patients [19].

This inconsistency of the findings can be due to differences in the studied interventions, health care context, and other underlying factors in the two contexts such as culture, beliefs, and social support of the patients in coping with the disease. Ninety percent of MS patients complain about severe stress and anxiety, and since these patients are more likely to suffer more severe psychiatric disorders such as stress and anxiety [20], then anxiety which is deeply rooted in the feelings and beliefs of MS patients should be consistently considered a fundamental MS-associated concern by healthcare system.

Aldridge et al. study to investigate the effect of music therapy, as a supplementary therapy, on 20 MS patients, demonstrated that this therapy caused a significant difference in the mean scores of stress and anxiety in four different intervals. Because depression, stress, and anxiety are closely associated in MS patients, it can be argued that relieving one of them can be effective in relieving the other two disorders [21]. The important finding of the present study was that the FHM was significantly effective in managing stress, depression, and total fatigue but not anxiety. However, the total score of anxiety decreased and health planners can manage anxiety in MS patients more efficiently and take more effective measures to manage this disorder.

Besides that, supplementary therapies have many advantages for MS patients and are widely administered to these patients. Approximately 1/3 of MS patients have been reported to use supplementary therapies despite accessing conventional and routine therapies. Moreover, acceptance of supplementary therapies has increased in the health care system and non-pharmacological interventions are increasingly used to supplement modern medicine [22].

Accordingly, the FHM, as an effective supplementary therapy in managing stress and depression, can be incorporated, as a useful approach, into health care programs. Relevantly, Bitsko et al. study

Table 1
The patients' demographic characteristics.

Variable	Group	Scale	Frequency percentage	Level of significance
Age	Control	Under 30 years	44%	P = 0.23
		30-60 years	52%	
		Over 30 years	4%	
	Experimental	Under 30 years	37%	
		30-60 years	40%	
		Over 30 years	4%	
Marital status	Control	Single	14.71%	P = 0.81
		Married	85.29%	
	Experimental	Single	20.58%	
		Married	71.42%	
Education	Control	Ability to read and write	5.76%	P = 0.69
		Below high school completion	23.52%	
		High school completion	35.29%	
		Higher than high school completion	35.41%	
	Experimental	Ability to read and write	7.70%	
		Under high school completion	26.47%	
		High school completion	29.41%	
		Higher than high school completion	36.41%	
Economic status	Control	Poor	26.47%	P = 0.12
		Average	38.24%	
		Good	35.29%	
	Experimental	Poor	29.42%	
		Average	35.29%	
		Good	35.29%	
Gender	Control	Female	61.76%	*P = 0.81*
		Male	38.24%	
	Experimental	Female	55.88%	
		Male	44.12%	
Frequency of recurrence	Control	No	54.3%	*P = 0.94*
		Once	34.3%	
		Twice and more	11.4%	
	Experimental	No	42.9%	
		Once	22.9%	
		Twice and more	34.52%	
Number of hospitalizations	Control	No	17.14%	*P = 0.58*
		Once	30%	
		Twice	30%	
		Three times	22.86%	
	Experimental	No	11.43%	
		Once	38.57%	
		Twice	21.43%	
		Three times	28.57%	

to investigate happiness training effect on quality of life and depression in 42 adolescents with leukemia in Virginia, the USA, demonstrated that eight sessions of happiness training caused decrease in depression symptoms and improvement of quality of life [23].

The findings of this study, based on eight sessions of active learning and the participants' collaboration, are consistent with Bitsko et al. study. It appears that that the programs developed within a larger number of sessions are more likely to lead to loading higher rates of happiness and more stable outcomes, and consequently more reliable results. Importantly, this program can be effective in patients with diseases rather than MS.

Being happy can explain approximately 95.5% of quality of life in MS patients. Psychological dimension is one of the dimensions of quality of life. Studies have confirmed decreased symptoms of psychiatric disorders with increased living a happy life in the patients, such that the patients that live a happy life have flexibility. Furthermore, the interventions lead to enhancing happiness and

Table 2
Mean scores of stress, anxiety, and depression in patients with multiple sclerosis for Fordyce Happiness Model at different times in the experimental and control groups.

Variables	Time	Experimental group		Control group		Independent *t*-test
		Mean	Standard deviation	Mean	Standard deviation	
Anxiety	Before intervention	16.94	(2.41)	16.11	(1.95)	0.12
	Immediately after intervention	14.96	(2.97)	16.26	(2.76)	0.07
	Three months after intervention	14.93	(2.81)	16.08	(2.53)	0.084
	Repeated measures ANOVA	0.007		0.93		
Stress	Before intervention	14.88	(2.5)	15.05	(2.08)	0.75
	Immediately after intervention	13.87	(2.97)	15.06	(2.55)	0.09
	Three months after intervention	13.57	(3.81)	14.97	(2.89)	0.1
	Repeated measures ANOVA	0.011		0.98		
Depression	Before intervention	14.57	(2.54)	14.25	(2.45)	0.6
	Immediately after intervention	12.96	(1.96)	14.08	(2.46)	0.044
	Three months after intervention	12.66	(2.59)	14.06	(1.98)	0.016
	Repeated measures ANOVA	0.003		0.99		

Table 3
Mean score of patients with multiple sclerosis for Fordyce Happiness Model at different times in the experimental and control groups.

Fatigue domains	Time	Groups		*t*-test
		Experimental	Control	
Behavioral	Before intervention	4.35	4.68	P > 0.05
	Immediately after intervention	3.17	5.12	P = 0.037
	Three months after intervention	3.10	5.38	P = 0.02
	Repeated measures ANOVA	P < 0.001	0.67	
Affective	Before intervention	4.72	4.58	P > 0.05
	Immediately after intervention	3.79	5.14	P = 0.03
	Three months after intervention	3.31	5.51	P = 0.006
	Repeated measures ANOVA	P = 0.001	P = 0.71	
Tactile	Before intervention	4.25	99/4	P > 0.05
	Immediately after intervention	3.76	5.29	P = 0.01
	Three months after intervention	3.22	4.47	P < 0.001
	Repeated measures ANOVA	P < 0.001	0.58	
Cognitive	Before intervention	2.66	2.86	P > 0.05
	Immediately after intervention	2.34	3.73	P = 0.06
	Three months after intervention	2.29	3.61	P = 0.021
	Repeated measures ANOVA	0.011	0.48	
Total fatigue	Before intervention	6.25	6.60	P > 0.05
	Immediately after intervention	4.45	6.87	P = 0.012
	Three months after intervention	4.33	6.81	P = 0.007
	Repeated measures ANOVA	<0.001	0.81	

alleviating certain diseases such as epilepsy, Huntington's disease, MS, Parkinson's disease, and stroke [24].

Liubomirsky et al. argued that the conditions and response to accidents are more appropriate in happy and optimist people. These people cope with stressful conditions more efficiently, have a stronger immune system, and deal with issues and incidents more creatively. Therefore, they manage stress more efficiently and acquire stress less often [25]. Because MS is a disorder of immune system, the FHM helped to moderate the psychiatric disorders in the patients through affecting their immune system.

The significance and role of happiness should be seriously considered in health issues. Fitzgerald et al. study demonstrated that happiness is 32% correlated with health. Mental health is a component of happy life and is not the same as physical health. Moreover, happiness and acquisition of rare disease are somehow associated particularly if the disease causes restrictions in doing individual activities [26]. In fact, disease-induced depression is due to loss of mental health which is somehow concurrent with loss of happiness. Addressing happiness in MS patients may lead to reduced acquisition of depression and other psychiatric and mental disorders in these patients.

Fatigue is another clinical symptom of MS which is largely associated with quality of life in MS patients and is seen in 67%–95% of them. Approximately 50%–60% of these patients consider fatigue to be the worst symptom of MS and 15%–40% consider it to be the most debilitating one [27]. Moreover, in a study on MS-associated disability, 81% of the patients reported to suffer fatigue, such that patients with higher levels of fatigue suffered higher levels of disability and had a lower quality of life [6].

In terms of management of the MS-induced problems such as fatigue, optimistic attitude is an important point. Optimist attitude can stop all serious suffering and concerns in the patient, increase longevity, slow down the course of MS, reduce the attacks, and delay the onset of permanent disability [28]. This study showed that supplementary therapies, such as FHM, may remove many fatigue-induced problems in the patients throughout the course of MS and assist them in living with MS.

In this regard, McCallugh et al. study on long-term exercise effect on quality of life and fatigue in MS patients with mild disability indicated that after a three-month period of exercise, fatigue improved considerably, but after six months of exercise, quality of life changed significantly [29]. It is therefore very important to address quality of life in MS patients with emphasis on certain symptoms such as stress, anxiety, and depression alongside fatigue, as in this study, these symptoms were investigated and the final outcome, i.e. quality of life, was seen to improve after implementation of the FHM.

Dayapoğu et al. study on the PMR effect on fatigue and quality of life in MS patients, demonstrated that quality of life and fatigue significantly improved [30], which is consistent with the present study.

Masoudi et al. conducted a randomized clinical trial to investigate the efficacy of a PMR technique in relieving pain in MS patients, and found no significant difference in the severity of subjectively perceived pain between experimental and control groups before intervention, while the intervention caused a significant difference in the corresponding pain between the two groups. Although Masoudi et al. investigated the severity of subjectively perceived pain, consistent with the present study, they indicated optimal effects of supplementary therapies on the complications and symptoms of MS [1].

We recommend further studies be conducted on supplementary therapies, alongside pharmacotherapies, and patients with MS and other diseases who are predisposed to specific mental disorders. Regarding these findings, we can argue that implementing FHM, aimed to improve peace and satisfaction in MS patients, can lead to positive effects. MS is a disease that may cause certain restrictions, including environmental, economic, human, and time-related, and special psychiatric conditions, and FHM is an approach that may greatly help to improve their quality of life.

5. Conclusion

According to this study, the FHM was effective in relieving depression, stress, fatigue, and to some extent, anxiety. Because of being implemented easily, being safe and accessible, causing no risk to the patient and his/her family as well as no costs, which is currently one of the concerns of health care system, FHM is recommended to be conducted on patients with psychiatric disorders especially MS.

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